Periodic Review of the Department of Chemistry

Introduction

1 An internal review of programmes in the Department of Chemistry was held on 26 and 27 June 2014. The members of the Panel were:
   • Dr David Carter, Associate Dean (Teaching and Learning), Faculty of Faculty of Arts, Humanities and Social Science, University of Reading (chair)
   • Dr David J. McGarvey, Head of Chemistry and Forensic Science, Keele University (external member, subject specialist)
   • Dr Samantha L. Pugh, Lecturer in the Department of Chemistry, University of Leeds (external member, subject specialist)
   • Dr Lisa Jutsum, Analytical Chemist and Technical Manager, CEMAS (external member, industrial specialist)
   • Dr Alex Arnall, Lecturer in the School of Agriculture, Policy and Development, University of Reading (internal member)
   • Miss Deb Heighes, Lecturer in the Institute of Education, University of Reading (internal member)
   • Ms Ioanna Evangelou, Part 2 BA History & Economics, University of Reading (student member)
   • Mrs Georgina Randall, Quality Support Officer (Partnerships), University of Reading, (secretary)

The Panel met the following:
   • Professor Anthony Powell, Head of Department
   • Dr John McKendrick, Departmental Director of Teaching and Learning
   • Dr Adrian Williams, Head of School
   • Dr Rebecca Green, School Director of Teaching and Learning
   • Dr Elizabeth Page, Deputy Head of Department
   • Professor Matthew Almond, Professor of Chemistry Education
   • Dr Joanne Elliot, Industrial Placement Officer
   • Dr David Nutt, Admissions Tutor
   • Dr Andrew Russell, Senior Tutor and Examinations Officer
   • Dr Roger Bennett
   • Dr Geoff Brown
   • Dr Ann Chippindale
   • Professor Howard Colquhoun
   • Professor Rainer Cramer
The Panel met students who represented the following degree programmes:
- MChem Chemistry
- MChem Chemistry with a year in Industry/Research
- BSc Chemistry
- BSc Chemistry with Forensics analysis
- BSc Chemistry with Education

General observations

The Review Panel was impressed with the excellent organisation and provision of extensive documentation on the Blackboard Organisation including the Self-Evaluation Document (SED) produced by the Department. The review team was also given a range of teaching and learning and assessment materials during the review.

The Panel wished to thank the range of staff involved in the meetings who were engaged and provided honest and constructive consideration to the elements of teaching and learning under discussion.

The Panel met with a good representative body of students and wished to thank them for their input. These students were a credit to the Department, were confident, articulate and fully supportive of the programmes under review. The students provided constructive comment on areas for improvement and clearly valued the work and existing mechanisms for reacting to student feedback demonstrated by Departmental staff.

Academic standards of the programmes

Educational aims of the provision and the learning outcomes

The programme aims and learning outcomes are well articulated in the programme specifications for the various BSc and Integrated Masters programmes and these are clearly communicated to students via hyperlinks within programme handbooks. The aims and intended learning outcomes are appropriately informed by the QAA Subject Benchmarking Statement and the Framework for Higher Education Qualifications. All BSc and Integrated Masters programmes are accredited by the Royal Society of Chemistry. The Panel identified an area of good practice in the various opportunities for students to: add value through a variety of placement opportunities; and transfer from undergraduate to postgraduate study based on attainment in Part 1 and 2. There were notable examples of students who may have entered through clearing and then progressed right through to PhD level, which is commendable.

The teaching, learning and assessment strategies are communicated via programme handbooks, programme specifications and in module descriptions and it is clear from
the documentation how the learning outcomes are assessed. External examiner reports over a number of years testify to the achievement of the programme learning outcomes by students. Opportunities for internationalising the curriculum are forthcoming through the NUIST 3 + 1 programme and through study-abroad opportunities.

8 The Panel identified the industrial placement year as an area of good practice, noting that it was highly praised by students and provides excellent opportunities for students to gain skills. However, the Panel did note that those not undertaking the placement year required more support and it is recommended that the Department think about the follow-through on Parts 1 and 2 careers and skills learning for students who do not go on an industrial placement, aiming to draw out and make more explicit transferable skills, especially in project work.

9 After discussion with students, the Panel noted room for improvement in the provision of mathematics support and recommends that the Department reviews the existing support provided. The Department should consider various forms of peer support for mathematics and other skills: for example peer assisted learning or the employment of postgraduate ASK advisers. In addition, consideration should be given to the possible introduction of physics support.

10 The Panel recognised an area of good practice in the use of research-led teaching in Parts 3 and 4 and would encourage the Department to consider extending this approach to Parts 1 and 2 where it is appropriate to do so. The Panel noted that the project work was often the time where ‘it all came together’ for the students; and for some students their engagement led to higher achievement than expected by earlier progress. The Panel therefore recommends that the Department explores early opportunities for the introduction of research-based teaching. For example, Part 1 and Part 2 students can be given opportunities to be exposed to the outputs of the final year projects. Final year students can also be involved in Research Day when Part 2 students are choosing their project areas.

11 The Panel noted that the demands of the curriculum leave students with limited opportunities to take credits from outside the Department, within the constraints of University policy. The Department is encouraged to keep this under review, and especially the extent to which Chemistry students learn languages through the Institute-Wide Language Programme.

Curricula and assessment

12 The SED and extensive materials made available via Blackboard demonstrated clear evidence of good variety of appropriate assessment methods, enabling students with various backgrounds to demonstrate achievement of learning outcomes and succeed.

13 The Panel gained a strong impression that feedback is effective in promoting learning. In particular the promotion of learning through informal feedback in small-group teaching (tutorials) was highlighted as an area of good practice. The Panel recommends that the Department should build on existing good practice in the use of technology to explore how it could further enhance student and staff experience of assessment and feedback.

14 The BSc and Integrated Masters Chemistry programmes are accredited by the Royal Society of Chemistry and the most recent accreditation report (2012) did not highlight any serious concerns, but made a number of recommendations the Department are
already addressing. External examiners’ reports over a number of years have testified to the academic standards of the programmes, the dedication of the teaching and support staff and the generally high quality of teaching. Although there is some year-to-year variation in achievement profiles of students, the overall picture is consistent with similar programmes at comparable institutions.

15 The Panel saw some examples of assessment criteria that allow examiners to identify different standards of work; this was particularly the case for the assessment of final year project reports. In discussions with staff the Panel learned that guidelines and assessment criteria are clearly communicated to students in a variety of ways and through the use of formative assessment, but this was not always clear in the examples of student work the Panel scrutinised. In the discussion with students it was evident that there was some confusion surrounding marking criteria, particularly for laboratory reports. The Panel recommends that the Department should enhance existing good practice in assessment and feedback by providing transparent assessment guidelines and marking criteria to students and demonstrators.

**Use of student management information**

16 The Panel were pleased to see that the Department has fully engaged with University Policy regarding Module Evaluation Forms, Personal Tutoring, Course Representatives and SSLC meetings. Nevertheless, it should encourage further student as well as further staff involvement in SSLC and there was limited evidence of student engagement in curriculum design and development. It is recommended that the Department looks more generally to make its systems of student engagement more robust, for example:

(i) by an increase in staff membership of the student-staff liaison committee and student membership of the Board of Studies;

(ii) by involving students in the planning process of the proposed in-house Chemistry careers fair.

Additionally, the Review Panel approved the suggested introduction of year tutors and recommends that this role could be made more dynamic with the introduction of student forums for each Part of the programme.

17 This Panel was happy to see that the results of Module Evaluation, NSS Research, SSLC etc. are reviewed at the BoS meetings and processed by individual members of staff. Overall, they are efficiently used to make adjustments and further enhance the curriculum. Moreover, the Panel noted that staff are keen in developing and maintaining good personal relationships with their student trustees and students in general, thus they are in position to monitor and assist their academic progress. This is recognised by students who expressed their satisfaction as well as their confidence in sharing feedback with staff, and is an example of good practice.

**Quality of learning opportunities offered by the programmes**

**Teaching and learning**

18 The learning experiences of undergraduates are enriched by innovative, varied and appropriately challenging activities, tasks and projects. This is evident in all parts of the programmes and this is recognised by the students.
The Panel noted an area of good practice in the transferrable skills modules provided and the value they brought to programmes. Normally taught in the summer term, these modules will need to be taught at a different time due to the change of the academic year structure. The Department is further recommended to think about how to use the teaching period in summer term in order to consolidate learning at Parts 1 and 2, enabling students to explore the links between sub-disciplines of the programme.

A further area for exploration is for opportunities for students to study abroad, for example (but not limited to) the link with Nanjing University of Information Science and Technology. The Panel recommends that the Department should investigate these opportunities further.

The Department is committed to high quality teaching and learning experiences and is responsive to student needs as they are identified. This is exemplified by the provision of additional support workshops in year 1; the careers advice offered to part 2 students; the monitoring of student progress; and routines in place to identify students ‘at risk’.

Student admission and progression

The Department invites all applicants for interview, which is a valuable part of the admissions process in terms of building relationships early on with the applicants. The award of degree classifications is in keeping with other universities and therefore the entry requirements and subsequent support appear to be appropriate for the requirements for the programme’s learning outcomes.

Students are actively encouraged to make use of support services (e.g. careers, skills support) across the institution. The Department also provides a comprehensive range of support for students, such as additional academic support drop-in sessions and career planning workshops. There is good liaison between staff involved in providing careers support and the University's careers service.

Learning resources

The Department’s Chemical Analysis Facility (CAF) is an excellent facility, and the undergraduate students and alumni consulted by the review team stated that this was a major reason why they chose to come to Reading in the first place. The ability of final year students to use the CAF for their projects in a relatively autonomous manner is a major strength of the Department and an area of good practice. It is also noted that efforts are being made to refurbish of the building’s entrance and main staircase to provide a more attractive environment for visitors.

The generally tired state of the building and teaching laboratories was highlighted within the Department’s SED as a key concern. The students that the review team spoke with were generally satisfied with the condition of these. However, it is noted that refurbishment of the teaching laboratories may be needed in the near-to-medium term in order to remain competitive. It was noted by the Panel’s external academic exerts that major investments in state-of-the-art chemistry teaching facilities are taking place in other universities, such as Liverpool, and these will likely attract the highest calibre students. In light of this, the Panel recommends that the University think about space and facilities need in the context of potential growth in the School and the incoming cohorts of NUIST students.
The crucial role of technical staff in setting up and maintaining laboratories was recognised by both staff, and PG and UG students. However, the Department has experienced some difficulties in the past year with the retention and training of staff, which has possibly effected the delivery of teaching.

**Employer engagement**

The Department clearly has a well-structured and very successful industrial placement process supported by staff and a range of collaborators from industrial, education and research facilities. The Department supports students in obtaining mini placements (at a school or research facility) and maxi placements (in an industrial or research facility including opportunities abroad). Feedback on the benefit of placements and especially a year-long placement is positive and it is clear that students feel that the compulsory ‘skills’ modules tackled in Parts 1 and 2 of the undergraduate programme gave them the necessary transferable skills to manage their placements appropriately with the desired outcomes.

The Department provides several other very good opportunities for industrial employer interaction with students through weekly colloquia and a Part 4 module taught entirely by industrialists. As well as this, the Department has introduced an industrial visit into the Part 3 and 4 programme, where visits are planned during ‘enhancement week’. Provision is also made for students wishing to pursue a career in academia through schemes such as the Undergraduate Research Opportunities Programme (UROP) and by the compulsory need to carry out a final year project as part of both the BSc and MChem programmes.

In-house careers advice is tailored to the chemistry graduate in ways that complement the services of the Careers, Placement and Experience Centre. The students felt well-provided in this area, although they noted that the university Careers Fair provision for chemistry-related graduate opportunities was poor. The Panel further recommends that the Department could do more to exploit and formalise their alumni and stakeholder networks at all stages, which would be beneficial for students to understand current employment opportunities.

**Enhancement of quality and academic provision**

The Department has an active Chemistry Education Group that provides leadership in teaching and learning in the Department. The Panel fully supports the intention to expand membership of this group. At present the Department is lucky to have a number of colleagues who are recognised at institutional and national level for enhancement and innovation in teaching and learning. There is the opportunity now for Department collectively to earn a reputation for excellence in chemical education and it is recommended that it explores ways in which this could be achieved. More generally, the review team recognised the important teaching and learning roles performed by key members of academic and support staff. The Department is recommended to think about succession planning around these roles.

The Department is continually reviewing and developing its provision in terms of content and teaching/assessment methods. Notable enhancements include the flipped classroom, small differentiated group tutorials, collaborative project work and challenging enquiry based practicals. Particular good practice was noted in the group practical projects in part 4 of the MChem, and the Department could consider how this approach might be developed into other parts of the programme.
The Department is encouraged to engage with as the new FLAIR initiative in order to ensure that as many teaching staff as possible are suitably qualified and recognised.

Main characteristics of the programmes under review

All the degree programmes offered are highly regarded by students, staff and alumni. This is clearly demonstrated by the sense of academic community that was in evidence throughout the review. Teaching was highly praised by students and innovative techniques are utilised to keep the programmes current.

Conclusions on innovation and good practice

The Panel commends the following as areas where the Department has particular strengths:

a) Different opportunities for students to progress from undergraduate to postgraduate studies based on attainment in Part 1 and 2.

b) Mechanisms to identify weaker students and the provision of guidance and support to these students.

c) Excellent use of small group tutorials.

d) The Industrial Placement Year, which students highly praised and provides excellent opportunities for students to contextualise their learning and put it into practice.

e) Student involvement in key decisions and confidence with which students expressed their ease with sharing feedback with staff.

f) Transferrable skills modules in Parts 1 and 2.

g) The use of the Chemical Analysis Facility in teaching and learning.

h) Research-led teaching in Parts 3 and 4.

Conclusions on quality and standards

The Panel is assured of the quality and standards of the programmes that have been reviewed, that the intended learning outcomes of the programmes are being obtained by students, and that the programme specifications are appropriate.

Recommendations

The Panel recommends to the Joint Faculty Board for Teaching and Learning for Science and Life Sciences that the following degree programmes taught by the Department of Chemistry should be re-approved to run for a further six years:

- BSc Chemistry
- BSc Chemistry with a year in Industry
- BSc Chemistry with Forensic Analysis
- BSc Chemistry via the Open University (OpenPlus route)
- MChem Chemistry
• MChem Chemistry with a year in Industry (as of 2014/15 this programme with be renamed MChem Chemistry with a Year in Industry/Research)

The Panel recommends that the following degree programmes be reapproved until the final cohorts graduate as indicated below:

• MChem Chemistry with Forensic analysis (closes at the end of academic year 2015/16)
• MChem Chemistry with a year in Europe (closes at the end of academic year 2014/15)
• BSc Chemistry with Education (closes at the end of academic year 2016/17)

The report will categorise any issues as follows, in order of priority:

• Those areas where the Review Team believes it is necessary for action to be taken urgently to safeguard the standard of provision;
• Those areas where it is advisable that the issues be addressed as soon as possible.
• Those areas where it is desirable that the issue be addressed over a longer time span.

The Panel does not consider that any recommendations must be addressed as a condition of re-approval.

The Panel makes the following recommendation to the University:

a) The University is encouraged to think about space and facilities needed in the context of potential growth in the School and the incoming cohorts of NUIST students. In addition, refurbishment of existing teaching laboratories may be needed in the near-to-medium term in order to remain competitive.

The Panel makes the following recommendations to the Department:

Advisable

a) The Department is advised to think about the follow-through on Parts 1 and 2 careers and skills learning for students who do not go on an industrial placement, aiming to draw out and make more explicit transferable skills, especially in project work.

b) The Department should build on existing good practice in the use of technology to explore how it could further enhance student and staff experience of assessment and feedback.

c) The Department is encouraged more generally to make its systems of student engagement more robust.

d) The review Panel approved the suggested introduction of year tutors and recommends that this role could be made more dynamic with the introduction of student forums at Part level.

e) The Department should enhance existing good practice in assessment and feedback by providing transparent assessment guidelines and marking criteria to students and demonstrators.

f) The review team recognised the important teaching and learning roles performed by key members of key academic and support staff. The Department is encouraged to think about succession planning around these roles.

Desirable
a) The Department should review the provision of mathematics support for Chemistry programme and the possible introduction of physics support.

b) The Department should explore opportunities to expose students to research-based teaching in Parts 1 and 2.

c) The Department is encouraged to think about how to use of the teaching period in summer term in order to consolidate learning at Parts 1 and 2, enabling students to explore the links between the sub-disciplines of the programme.

d) The Department should look for further opportunities for students to study abroad, for example (but not limited to) the link with Nanjing University of Information Science and Technology.

e) The Department could do more to exploit and formalise their alumni and stakeholder networks.

f) The Department has the opportunity collectively to earn a reputation for excellence in chemical education and it is recommended that it explores ways in which this could be achieved.

41 The Panel does not have a recommendation to the Joint Faculty Board for Teaching and Learning for Science and Life Sciences as to whether any proposal(s) for new degree programmes should be approved as this is not applicable.